Annual Business Report of the Tundra Ecosystem Research Station Daring Lake, NT Calendar Year 2009

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Abstract

The Tundra Ecosystem Research Station, located at Daring Lake, Northwest Territories, was established in 1994. The surrounding pristine environment is used as a control site for environmental monitoring studies that examine the effects of diamond mining in the Lac de Gras area. In addition to impact monitoring, the research station is a valuable asset for baseline studies, ecosystem research and monitoring, and educational programs. In 2009, the research station was operational for 167 days, with 1214 person days of use, and an average of 12 people at camp per day. Although the research station operated for a longer period of time in 2009 (167 days versus 137 days in 2008), total person days of use decreased from 1492 in 2008 to 1214 in 2009. A total of 101 people used the facility in 2009, with 27% of those being university researchers, a decrease of 31% from the previous year. The reduced number of university researchers is likely a result of decreased funding from the International Polar Year (IPY) program. The government led 12 research and monitoring programs, while universities also led 12 research studies. New researchers included people from the Canada Centre for Remote Sensing, Public Works Canada and several departments of the Government of the Northwest Territories. Several upgrades were made to the Daring Lake facilities in 2009 including the construction of a new laboratory for university researchers and the conversion of the old university lab into a small bunkhouse. Energy efficient heaters were installed in the new laboratory, the ENR lab and the main bunkhouse, replacing old inefficient oil drip heaters. A new solar powered grey water system was also commissioned. Environment and Natural Resources received its first 5 year land use permit for the facility from the Wek'eezhii Land and Water Board and developed a comprehensive waste management plan and spill contingency plan. Indian and Northern Affairs Canada continued to be a major supporter of the research station by providing substantial funding towards operations, maintenance, and researcher costs.

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Introduction

In 1994, the Department of Environment and Natural Resources (ENR), Government of the Northwest Territories (GNWT), established the Tundra Ecosystem Research Station (TERS) at Daring Lake, NT. TERS was developed largely in response to impending diamond development on the central barrens (Figure 1). Over the past 16 years, ENR has worked with federal and territorial government departments, universities, industry, and communities to conduct a multidisciplinary program of environmental research and monitoring studies. Although university research is typically short-term in nature, many of the monitoring programs addressing such issues as climate change began when the research station was established, and are still on-going. The success of TERS to facilitate research and monitoring activities and educational programs is due in part to its location, many partners, and the cooperative approach that has evolved to manage and operate the facility.

In the early years, many of the research and monitoring programs consisted of wildlife studies designed to address issues related to diamond mine developments in the Lac de Gras area. The Daring Lake area acts as a baseline and control area from which to compare the results of research and monitoring studies in affected or impacted areas, such as the diamond mines. Many of these studies were associated with the West Kitikmeot Slave Study, which was carried out from 1996 to 2001.

The number of people using the research station has increased steadily over the past four years partly due to increased funding for researchers through the International Polar Year Program. The research and monitoring program at Daring Lake has grown to become a multi-disciplinary program consisting of government and academic studies. ENR continues to solicit

new partners for its research and monitoring program in this sub-arctic region of the Northwest Territories. ENR and its partners also continue to support educational programs based at the research station (e.g. Tundra Science Camp) and use the facilities as a base for enforcement activities in the region.

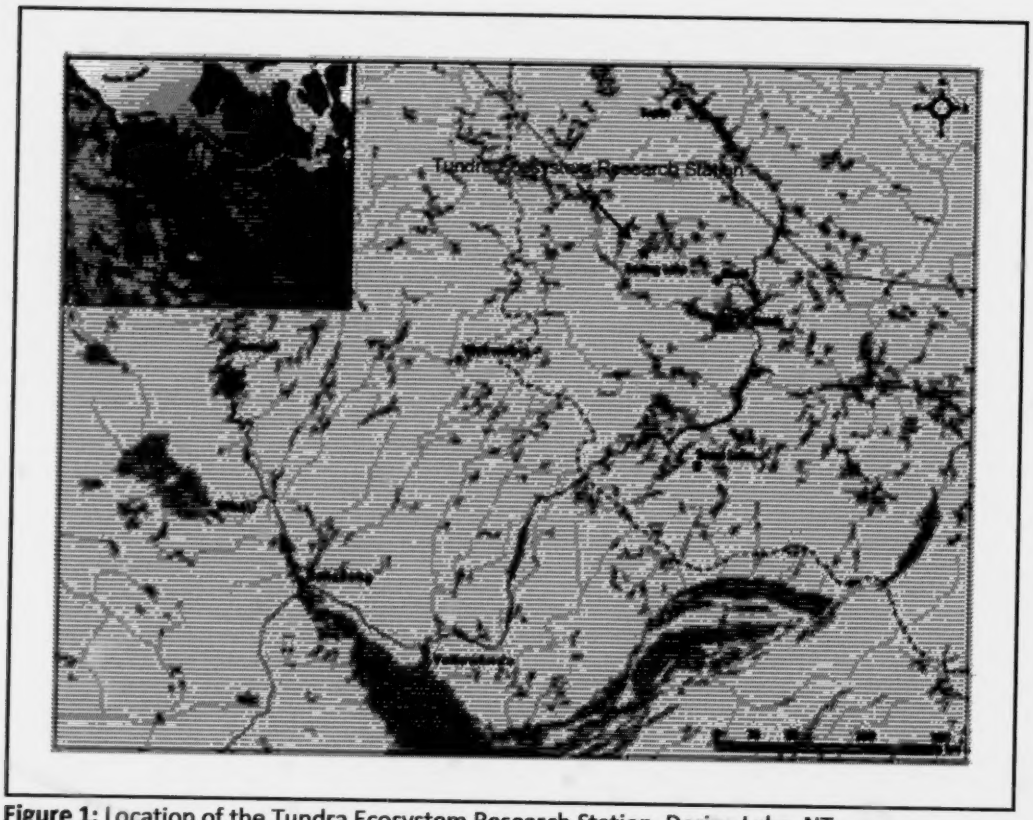

Figure 1: Location of the Tundra Ecosystem Research Station, Daring Lake, NT

The purpose of this report is to provide a summary of activities and business aspects of the research station over the past calendar year. The reporting period of a calendar year allows for the capture of all field and business related activities that occur within a single field season of station operation.

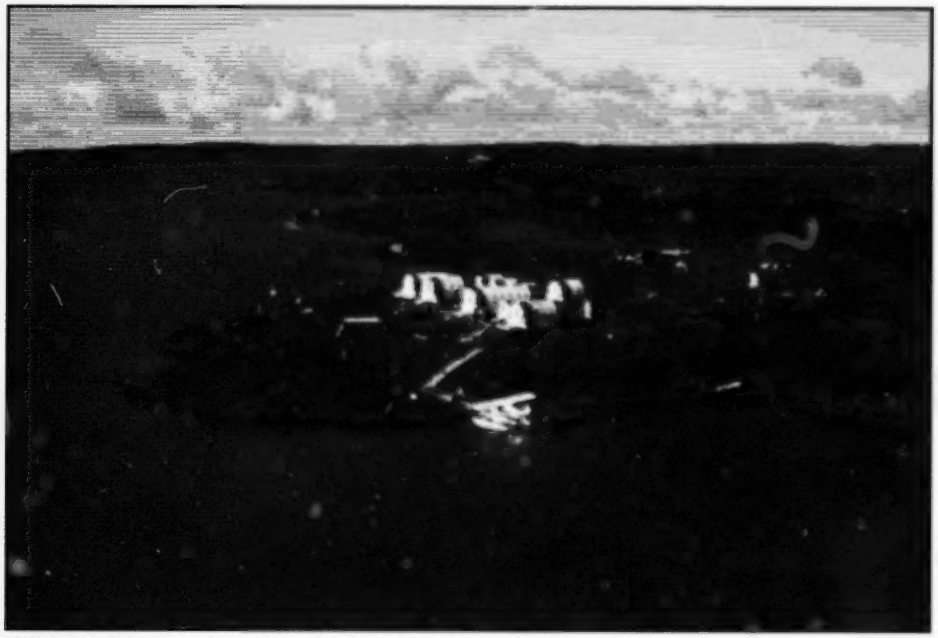

Photo 1: Tundra Ecosystem Research Station, 2009.

Mandate of the Station

The Department of Environment and Natural Resources is committed to:

1. Provide a quality field station and safe working environment for users.
2. Provide a state-of-the-art model facility that uses green technologies for energy production, heating, and waste management.
3. Provide overall camp management, including administration and maintenance, both on-site and in Yellowknife.
4. Coordinate field activities and use of the facilities for all parties.
5. Assist with logistic support and subsidize researchers' logistic costs.
6. Make the research station available for environmental research and monitoring programs, education programs, inspection and enforcement activities, meetings and other appropriate uses.

Current Facilities

From its early beginnings of three Weatherhaven buildings, TERS has grown on an annual basis to accommodate an increasing number of researchers. Presently, the camp consists of 11 buildings, which includes an office building, two accommodation buildings, cooking/dining hall, washhouse, two laboratories and several buildings for storage and maintenance of equipment. In 2006, the fenced-in compound increased in size to accommodate the expanded facilities.

The camp comfortably accommodates up to 16 persons during the winter months when heated buildings are required and up to 25 persons during the summer months when small tents can also be used. For short periods of time during the summer, the research station accommodates large numbers of users. During ENR's annual cross-cultural environmental education camp (which operates for 10 days in late July to early August), approximately 35 to 40 individuals are accommodated through the use of bunk houses, storage facilities and small tents.

TERS provides a variety of laboratory and field equipment, including boats and motors, and snowmobiles for use by researchers. The power system generates 1300W of solar power and 1000W of wind power. This renewable energy is stored in a 24 volt battery bank for use in the camp. Backup power is provided by a 4500 watt inverter generator. Human waste is managed through the use of a propane incinerating toilet and a pit toilet. Kitchen waste is composted and returned to Yellowknife for use in community gardens, recycled or incinerated using the camp's Smart Ash© waste incinerator. Communications are provided by MSAT and Iridium satellite phone services. Field communication is provided by VHF hand-held radios and a base station located in camp. High-speed wireless Internet service is available to all camp personnel. An

electric bear fence around the perimeter of the camp compound provides an effective deterrent to grizzly bears frequenting the area.

In 2009, camp improvements included the construction of a new 16' X 24' laboratory for university researchers, conversion of the old university lab into a small 6 person bunkhouse, the installation of three new energy efficient oil heaters and the commissioning of a new solar powered greywater system.

Photo 2: The new laboratory built in 2009.

Camp Management and Administration

Administration, management, operations and coordination of field activities at the camp is the responsibility of the Environmental Assessment (EA) Biologist, Wildlife Division, ENR.

Since 2000, Wildlife Division, ENR, has hired a full-time seasonal Camp Manager, who resides at the camp from May to September. in addition to carrying out the administrative and

managerial responsibilities of the position, the on-site Camp Manager, usually a biology summer student, conducts fieldwork for a number of on-going research and monitoring programs for the Department.

TERS is a partial service facility and operates on a partial cost recovery basis. Researchers staying at the station are required to assist in a variety of camp duties such as building maintenance, cooking, and cleaning. These various activities ensure daily user fees are kept to a minimum. Currently, the per diem charged to users ($30.00) is subsidized by ENR at more than 70 percent. It is estimated that the unsubsidized per diem rate for users is approximately $100. Monies collected through per diems cover expenses such as annual improvements, fuel oil and propane, consumable materials and supplies, and air charters to transport materials and supplies, including groceries, to the facility. Users are also required to pay for groceries and air charter costs for personnel, which are invoiced to them at the end of the field season.

In addition to overall management of TERS, the EA Biologist is responsible for supervising the on-site Camp Manager. Administrative duties are shared between the EA Biologist in Yellowknife and the Camp Manager. Such duties include arranging logistic support for researchers (e.g. air charters and ground transportation), shipping and handling of equipment, supplies and samples to and from the camp, tracking camp costs (including payables and receivables), and arranging other user requirements such as first-aid and bear safety courses.

Since 2007, ENR has used a centralized system of scheduling air charters (for all users) and purchasing food and supplies for the camp. This administrative system has proven to be the most cost effective and efficient way to operate for all parties. The EA Biologist also makes decisions with respect to infrastructure needs, major purchases, and maintenance

requirements. In some cases, contract services are procured for some aspects of station maintenance that require a specific trades person, such as an electrician or carpenter.

To address safety and liability issues, ENR requires that all users sign a "Waiver of Liability" form, and comply with a "Conditions of Use" document that addresses issues and requirements pertaining to firearm safety and use, bear safety and first-aid training, emergency response preparedness, research permits, etc. Users are also required to provide personal medical information as per the station's "Personal Medical Form".

Photo 3: Twin Otter resupplying the fuel cache at Daring Lake.

Land use inspections are conducted annually at TERS by INAC land use inspectors since the camp was first established in 1994. In 2009, ENR received its first land use permit for TERS from the Wek'eezhii Land and Water Board. ENR developed a Waste Management Plan and a Spill

Contingency Plan that were submitted with the application for the camp's land use permit. The current 5 year land use permit expires in 2014.

Partnerships

The operational model at TERS depends on participation, cooperation and cost sharing by all of its partners, including users and stakeholders. Contributions to TERS include in-kind support, cost sharing of air charters, direct financial contributions (both operations and maintenance, and capital dollars), donations of equipment, supplies and fuel, plus a variety of other goods and services. A list of partners in TERS is provided in Table 1.

Table 1: Partners in the Tundra Ecosystem Research Station

Government of the Northwest Territories	Government of Canada
Wildlife Division, ENR	Indian and Northern Affairs Canada (INAC)
North Slave Region, ENR	Environment Canada (EC)
Environment Division, ENR	Meteorological Service of Canada (MSC)
Policy and Strategic Planning Division, ENR	Department of Fisheries and Oceans (DFO)
Shared Services, Informatics Division, ENR	
Prince of Wales Northern Heritage Centre, ECE	
Universities	**Other Agencies**
Queens University (QU)	Arctic Ecology and Development Consulting
University of British Columbia (UBC)	Tlicho Community Services Agency
Trent University (TU)	Yellowknife Education District #1
Wilfrid Laurier University (WLU)	Yellowknife Catholic School Board
University of Calgary (U of C)	
Carleton University (CU)	
University of Northern British Columbia (UNBC)	
University of Saskatchewan (U of S)	
University of Waterloo (UW)	
Nippissing University (NU)	

Station Use

During 2009, TERS was operated for a total of 167 days between March 30 and September 7. The number of person days of use at the station was 1214 compared to 1492 in 2008. Although the number of person days decreased, the average number of people in camp increased from 11 to 12, an increase of 9% from the previous year. A total of 101 individuals used the facility in 2009, with 27% of those being university researchers, a decrease of 31% from the previous year. The reduced number of university researchers and overall reduced person days of use is likely a result of decreased funding for research from the International Polar Year program. New researchers included people from the Canada Centre for Remote Sensing, Public Works Canada and the Government of the Northwest Territories. Thirty-five people used TERS during the Tundra Science Camp during its operati from July 25 to August 3.

In 2009, GNWT researchers were the primary user of the facilities (32%) followed by university researchers (27%) and ENR's environmental education program (Tundra Science Camp at 24%). These top three user groups made up approximately 83% of total person days of use. The remaining 17% of use was made up of management and maintenance, federal government users, enforcement personnel and visitors. Figure 2 shows total annual use of the research facility over the past four years and percent use by four major groups. Noteworthy is 2008, the peak year of use and the peak year of research funding provided by the International Polar Year program. ENR's use of the facilities increased in 2009 due to new projects such as the ecosystem mapping work done in the Southern Arctic Ecozone, which included the Daring Lake area.

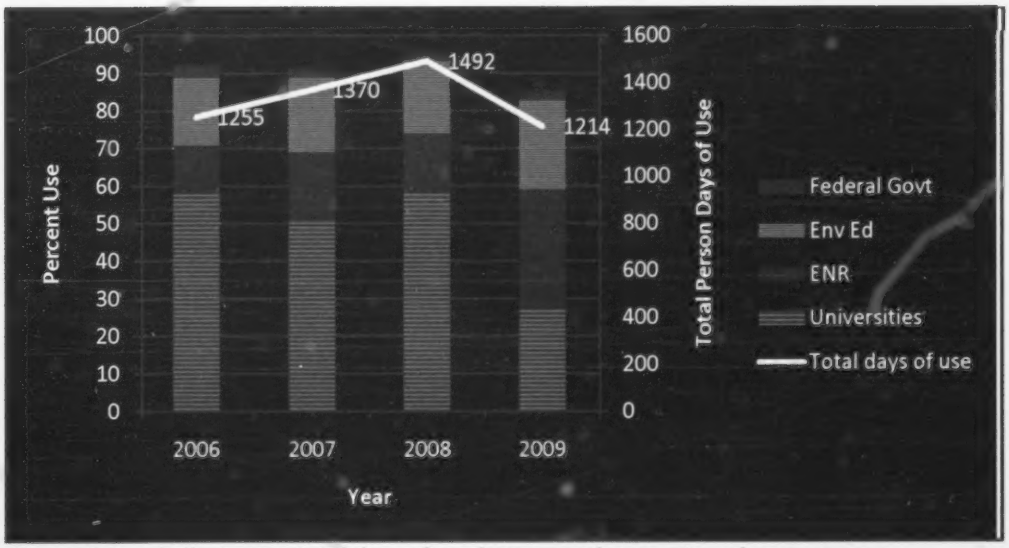

Figure 2: Graph illustrating total days of use by year and percent use by user group

Photo 4: Dr. Paul Grogan and his research team from Queen's University.

Figure 3 provides a detailed breakdown of TERS users in 2009.

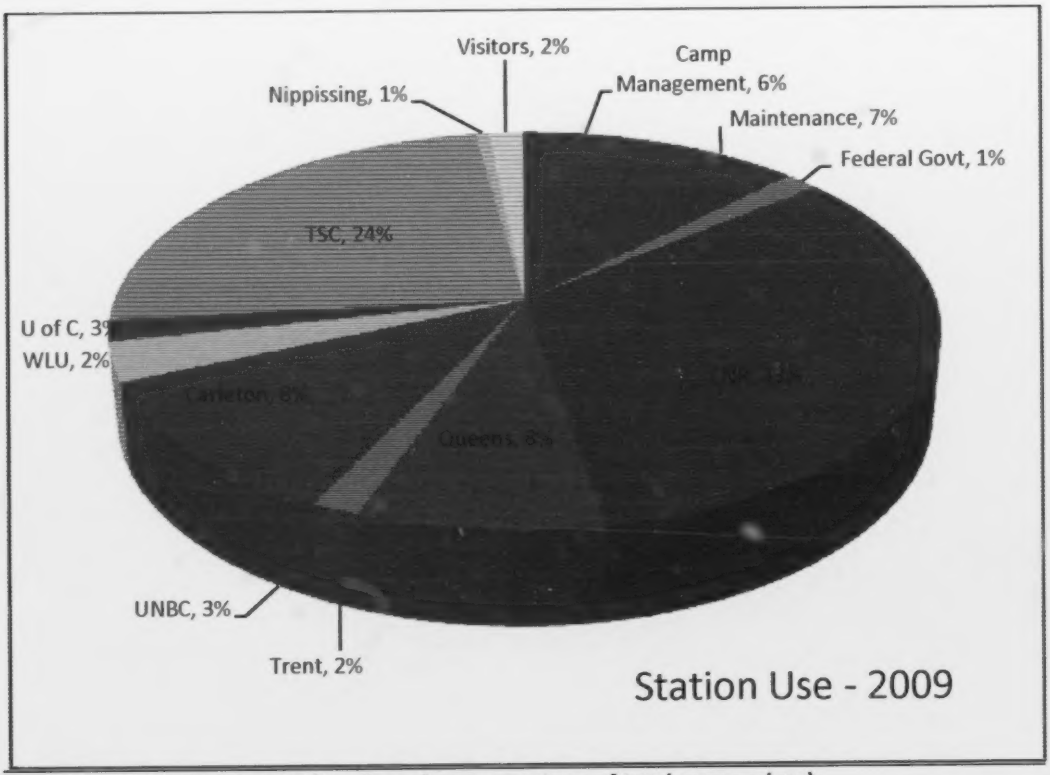

Figure 3: Station Use - 2009 (Use based on percentage of total person days)
Nb: TSC – Tundra Science Camp, ENR – Environment and Natural Resources, U of C – University of Calgary, UNBC – University of Northern British Columbia, WLU – Wilfrid Laurier University, NU - Nippissing University.

Research and Monitoring Priorities

ENR has identified a number of research and monitoring priorities for the Daring Lake area.

These include:

- Environmental impact assessment;
- Climate change;
- Biodiversity and protected areas;
- Species at risk;
- Disease and contaminants; and,

- Air quality

These priority areas provide a coarse filter for ENR to screen potential researchers wishing to conduct research and monitoring activities in the Daring Lake area using TERS. The Department encourages cooperative research and monitoring work, integrated, multi-disciplinary programs, studies involving northerners (including northern students) and the use of traditional knowledge.

In addition to providing logistic support and subsidizing researchers' daily costs, the Department sponsors several researchers by providing in-kind support and financial assistance for students who receive scholarships through the Natural Sciences and Engineering Council of Canada's (NSERC) Northern Intern Program, the Association of Canadian University for Northern Studies (ACUNS), and the Arctic Institute of North America (AINA). The Department encourages researchers (government and university) to hire northern summer students to assist with their studies at Daring Lake.

Communication and dissemination of study results to communities, northerners and the general public is an important component of every study. Researchers are encouraged to prepare research papers, posters and lay person summaries for a variety of audiences. Copies of publications and posters are sent to the EA Biologist (Wildlife Division, ENR) and added to ENR's library of Daring Lake studies. Northern forums such as the Science in the Changing North Conference and the Geoscience Forum, annual events held in Yellowknife, are used to present research findings in addition to publishing in journals or other media.

Research, Monitoring and Education Programs

TERS supports a wide range of short and long-term research and monitoring programs. Short-term research, such as Masters level projects, is generally completed after one to two years of data collection. Many of the long-term research and monitoring programs are on-going and some have been in existence for more than ten years.

Many of the monitoring studies conducted at Daring Lake are "control" studies contributing to the assessment of the effects of mining developments in the region, including the Ekati and Diavik diamond mines. Two examples of these studies are the Raptor Monitoring Program being conducted in cooperation with BHP Billiton and Diavik Diamond mines and a study examining the effects of diamond mining on wolverine populations.

TERS also supports activities such as environmental educational programs (e.g. Tundra Science Camp) and enforcement work conducted by Renewable Resource Officers (ENR), Fisheries Officers (DFO), and Land Use Inspectors (INAC).

Table 2 provides a list of the current research and monitoring programs being conducted by government agencies in the Daring Lake area. Government programs include local studies (e.g. vegetation inventory and classification), regional programs (assessing development impacts) and national and international programs related to climate change (e.g. International Tundra Experiment).

Table 3 is a list of university research programs. Many of the university led research programs focus on issues related to climate change and ecosystem processes. The majority of research and monitoring programs being conducted at Daring are directly or indirectly related to the Department's environmental mandate.

Table 2: Government Research and Monitoring Programs in the Daring Lake Area - 2009

Project	Researcher Affiliation
Water quality monitoring of the Coppermine River Basin	Robin Staples, Bob Reid, Indian and Northern Affairs Canada
Hydrology and climate monitoring	Bob Reid, Indian and Northern Affairs Canada
Snow studies at Daring Lake	Dr. Chris Derksen, Meteorological Service of Canada, Environment Canada
Ecosystem mapping of the Southern Arctic Ecozone	Bob Decker, Environment and Natural Resources, Government of the Northwest Territories
International Tundra Experiment – monitoring the effects of climate change on plant phenology	Steven Matthews, Andrew Krisch, Environment and Natural Resources, Government of the Northwest Territories
Vegetation classification of the Daring Lake area	Joachim Obst, Arctic Ecology
Breeding bird surveys at Daring Lake	Joachim Obst, Arctic Ecology
Small mammal monitoring – population trends	Steven Matthews, Suzanne Carrière, Environment and Natural Resources, Government of the Northwest Territories
Raptor monitoring in the Daring Lake area	Steven Matthews, Environment and Natural Resources, Government of the Northwest Territories
Denning ecology of tundra wolves	Dean Cluff, Environment and Natural Resources, Government of the Northwest Territories
Abundance and population trends of wolverines	Robert Mulders, Environment and Natural Resources, Government of the Northwest Territories
Archaeological assessment and inventory of the Daring Lake area	Tom Andrews, Prince of Wales Northern Heritage Centre, Education, Culture and Employment, Government of the Northwest Territories

Photo 5: Building greenhouses in Research Valley.

Table 3: University Research Projects in the Daring Lake Area - 2009.

Project	Principle Researcher, Supervisor Affiliation
Carbon flux, nutrient cycling and respiration of arctic plants	Dr. Paul Grogan, Mat Vankoughnett, John Xu and Haiyan Chu, Queens University
Near-surface thermal regime of permafrost terrain in the Slave Province	Dr. Elyn Humphreys, Kumari Karunaratne, Dr. Chris Burn, Carleton University
Snowpack assessment and monitoring in the Daring Lake area	Dr. Michael English, Wilfrid Laurier University
Interaction of biting insects and forage availability for caribou of the Bathurst herd	Leslie Witter, Dr. Chris Johnson University of Northern British Columbia
Variation in CO_2 exchange on the tundra	Dr. Peter Lafleur, Trent University, and Dr. Elyn Humphreys, Carleton University
Remote sensing and isotopic tools for discerning multi-scale data issues in arctic hydrology	Andrew Rees, Dr. Michael English, Wilfrid Laurier University, and Dr. Chris Derksen, Meteorological Service of Canada, EC
The relationship of soil nematode communities and nitrogen cycling in the arctic tundra	Meghan Laidlaw, Dr. Paul Grogan, Queens University
Monitoring changes in vegetation at ITEX plots	Laura Machial, Robyn Hooper, Dr. Greg Henry, University of British Columbia
Growing season carbon budget of an arctic fen – measuring carbon dioxide and methane exchanges	Jonny Vandewint, Dr. Elyn Humphreys, Carleton University
Development and survival of the parasite *Ostertagia gruehneri* in barren-ground caribou with respect to climate change	Bryanne Hoar, Dr. Susan Kutz, University of Calgary
The influence of subsidence on carbon dioxide and methane exchanges in arctic peatland	Samantha Piquette, Dr. Elyn Humphreys, Carleton University
Effects of climate change on caribou-vegetation interactions in low arctic tundra	Tara Zamin, Dr. Paul Grogan, Queens University

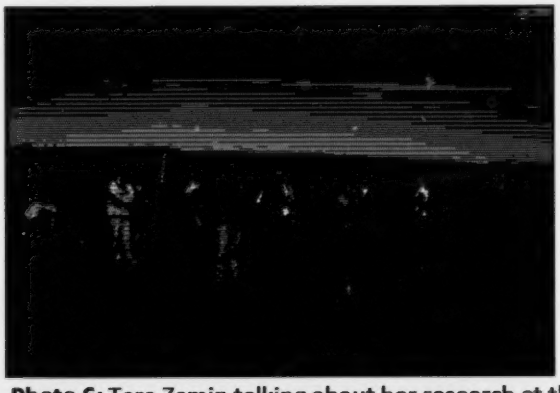

Photo 6: Tara Zamin talking about her research at the exclosures.

Station Improvements and Costs

In order to better accommodate university researchers and other TERS users, several improvements were made to the facilities in 2009. A new, large, Weatherhaven laboratory was purchased and erected, complete with lab benches, heating and electrical power. This new lab for university researchers replaced the existing small university lab which was refurbished into a second bunkhouse for summer use.

In a continuing effort to lower heating costs at TERS, energy efficient Toyo oil heaters (Model Laser 56) were installed in the new laboratory, the main bunkhouse and the ENR lab. Although the Toyo heaters require electrical power to operate, it was determined that the existing alternate energy system used to provide electrical power throughout the camp, was capable of providing sufficient power without have to run a gas generator. The installation of the Toyo heaters completes the heating renovations to all the buildings that could be used during the winter months. This includes the kitchen/dining building, two labs and the main bunkhouse. The new heaters use 50% less fuel oil compared to the conventional drip heaters that were replaced. Other improvements to the facilities included insulating 2 Weatherhaven storage buildings, construction of a platform for the Tundra Science Camp nimba, commissioning of the new greywater disposal system and the purchase of a new backup gas generator. The total cost of the improvements was $53,555. The most significant improvement was the purchase and construction of the new university laboratory costing close to $40,000 when it was fully operational. As TERS ages, (it is now over 15 years old) it can be expected that maintenance and replacement costs for infrastructure and equipment will increase in the future.

Photo 7: New greywater holding tank.

Photo 8: New, covered greywater pit.

Table 4 provides a summary of all operating expenditures incurred in the 2009 calendar year. Some operational costs such as satellite phone charges, groceries and air charters for personnel were charged back to individual users as part of TERS' user pay system. The cost of shipping groceries and other supplies to the camp is not reflected in this table since these goods were transported on charters paid for by the different research groups.

From May to September, ENR hires a summer student to be the on-site Camp Manager. The salary paid to this individual is included in the total operating cost. Approximately 35 % of the Department's EA Biologist's time is also spent managing the facility. Currently, this is an in-kind contribution from ENR.

The expenditures for the research station in 2009 were $123,086 up slightly from $118,565 in 2008. Excluding facility improvements, the operational expenditures for 2009 were $69,530 of which $26,100 (or 38%) was the on-site Manager's salary. It should be noted that many of operational costs (e.g. heating oil, propane, communications services, on-site manager's salary) are generally fixed costs incurred annually regardless of the number of TERS users.

Table 5 lists the funding sources and financial contributions made to cover the costs of operating the TERS in 2009. ENR contributed 51% towards the operating costs, INAC contributed 41% and user fees contributed 8%. Monies collected through user fees were used to reduce ENR's cost to $52,952. Based on total expenditures for 2009 and the number of person days that the station was in operation, the cost per day per person was $101.39. At the current daily charge rate of $30.00 per person, user costs are subsidized by over 70%.

Indian and Northern Affairs Canada (INAC) continues to be a major partner in TERS providing financial and logistic support to facility operations, researcher support and educational programs. INAC's financial contribution to TERS operations in 2009 was $50,000.

Table 4: 2009 Operating Expenditures

[redacted]		[redacted]		[redacted]					
Weatherhaven Laboratory	$37,029.64	General Operations	$8,654.99	Satellite Phone - Annual Service Fee	$479.50	Heating Oil	$750.00	Camp Manager (Summer Student)	$26,199.99
Storage Building Insulation Kits (2)	$6,676.70	Maintenance Contract	$3,946.00	Satellite Phone Charges	$651.48	Propane	$1,167.53		
Toyo Oil Heaters (3)	$6,288.00	As Clarion	$27,137.52	Internet Service - Annual Charges	$149.50				
Greywater Pump	$349.79								
Tents (2)	$1,499.00								
Honda Pump	$539.30								
Work Suits	$731.25								
Mattresses	$879.00								
Generator	$3,899.00								
TOTAL	$63,565.71		$39,732.50		$1,780.48		$1,917.53		$26,199.99
GRAND TOTAL	$123,086.22								

Notes: 1) General operations costs include grocery costs for the Camp Manager and maintenance personnel.
2) The table does not include monies spent by the federal and territorial government to support research, monitoring and educational programs at TERS.
3) The Salary figure for the Environmental Assessment Biologist as the Manager of TERS is not included.
4) 43% of the total operating costs for 2009 were for TERS improvements.

Table 5: Funding sources to cover operating costs

Funding Source	Operating Cost	Contribution
ENR, GNWT	$62,942.10	51%
INAC	$50,154.12	41%
Accommodation Fees/Offsets	$9,990.00	8%
TOTAL FUNDS	**$123,086.22**	

Note: Accommodation Fees/Offsets reduced ENR's cost to operate TERS

Successes

1) Research and Monitoring

TERS and the Daring Lake area continue to be a focal point for environmental research and monitoring in the Lac de Gras area of the Slave Geological Province. Much of the scientific data being collected is contributing to our understanding of baseline conditions by filling information gaps, helping to better understand ecological processes, and monitoring the impacts of climate change and industrial development on species at risk and biodiversity. Through TERS and its partnership approach, ENR has fostered cooperative relationships with a number of government departments, universities, mining companies and aboriginal communities. This model has led to a diverse program of 24 short and long-term environmental research and monitoring programs addressing many of the priority environmental issues of the region.

The Daring Lake area is also home to several national and international environmental studies such as the International Tundra Experiment, examining the effects of climate change on plant phenology and productivity. The International Polar Year Program (2007 to 2009) provided considerable funding to university researchers that resulted in more researchers using the research station and an expanded scope of the research program at Daring Lake. As the IPY Program concludes, university researchers will be looking to the federal government for a follow-on program that will support future initiatives and the legacy that IPY established.

The Tundra Ecosystem Research Station and its diverse program of research and monitoring has become an important site for environmental research and will be a key component of a future network of sites as the High Arctic Research Station and network is established.

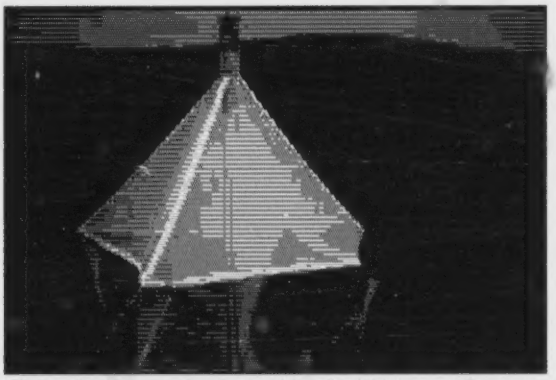

Photo 9: Research student Leslie Witter with an insect trap.

2) Tundra Science Camp

The Tundra Science Camp (TSC) is an important component of the activities that take place at TERS. TSC is an opportunity for high school students and teachers in the Northwest Territories to work closely with environmental educators, on-site scientists and Dene elders to learn about field and laboratory techniques in wildlife ecology, ornithology, plant ecology, geology, archaeology, and human history. It also provides an opportunity for all participants to understand different cultures and approaches to western science and traditional knowledge.

ENR coordinates the TSC and provides core staff. Other resource people include the Territorial Archaeologist from the Prince of Wales Northern Heritage Centre, a geologist from the Northwest Territories Geoscience Office, Dogrib elders and several environmental education specialists. INAC assists with logistic support and local Boards of Education assist with student recruitment and financial support.

In 2009, the cross-cultural environmental education camp took place from July 25 to August 3. Fourteen students and one teacher from the communities of Behchoko, Fort Providence, Whati, and Yellowknife attended the Tundra Science Camp.

Photo 10: Michel Rabesca and Science Camp students butchering a caribou.

3) Student Opportunities

Research and monitoring studies, along with environmental education programs at Daring Lake, provide unique opportunities for students to work and learn about the low arctic tundra environment. ENR has encouraged researchers to hire local people and involve northern students in their programs. These opportunities provide northern students with field experience and information necessary to make future education and career choices. Many of the students that have been to Daring Lake have pursued post-secondary education at southern educational institutions and returned to the North to be employed in both the private and public sectors. The Tundra Science Camp is a unique opportunity for young people to experience all aspects of living and working at a remote field research station on the barrens.

In 2009, ENR employed two summer students to manage the research station at Daring Lake. Chandra Venables, a PhD student, was the On-site Camp Manager and Lukas Madsen, a former Science Camp student, were employed as manager trainee and field assistant. TERS is a valuable training facility for all summer students employed by ENR. Two Headquarters based

summer students worked at the research station providing field support to resident researchers. Other non-GNWT individuals that worked at Daring Lake included Lori White from the Canada Centre for Remote Sensing, Patti Garbutt from Public Works and Services Canada, and Jana Ebersbach, a foreign exchange student from Germany.

ENR continues to support northern students working at TERS by providing funds via scholarship programs, subsidizing university hired students and providing in-kind support to research and monitoring programs.

Photo 11: Students learning to use radio telemetry equipment.

Challenges and Opportunities

1) Facilities

TERS currently operates at near capacity during the spring and summer months. The addition of the new laboratory and bunkhouse should alleviate concerns regarding overcrowding during peak periods of use, generally during the months of July and August. At present, there are no plans to expand the facility beyond its current size.

If the number of researchers increases beyond its current use, there are opportunities to change the operational model for the facility. It could move from a cooperative, partial service facility to a full service facility including a full-time cook and maintenance staff. Such changes would have financial implications for researchers using the facilities. For example, the employment of a full-time cook would increase the daily user fees from $50.00 per day (for food and lodging) to approximately $100.00 per day. Year-round operation of TERS is also possible but would have financial implications for users given the cost of managing and heating the facility during the winter.

2) Station Promotion

ENR will continue to promote the use of TERS for priority research and monitoring programs in a partnership approach. As a partner and participant in various workshops and conferences, the Department will continue to assist researchers in effectively communicating their work to a variety of audiences. In 2008, a web page was developed for the Canadian Polar Commission that features TERS in its directory of northern research facilities. A web page was also developed on the ENR website to feature and promote TERS at Daring Lake. (http://www.enr.gov.nt.ca/_live/pages/wpPages/Tundra_Ecosystem_Research_Station.aspx).

TERS continues to be a model facility throughout Canada. In 2009, Steve Matthews attended the first meeting of northern research station managers and operators in Ottawa. This meeting, sponsored by the Canadian Polar Commission, was a forum for research station managers to exchange information and ideas about northern research facilities, their management and operations. A presentation on TERS was given at the workshop where it became evident that the Daring Lake research station is the first new research station to be built in Canada's north in 35 years. Given that TERS is a modern alternate energy facility using the latest technologies

from power generation to waste management, there was considerable interest in the facility. Subsequent to the Ottawa meeting, the TERS was visited by Jean-Marie Beaulieu from the Canadian Polar Commission in July 2009.

3) Daring Lake Protected Area

The Department of Environment and Natural Resources continued to work with the Protected Areas Secretariat and the Tlicho Land Use Planning Working Group to discuss options for establishing the Daring and Yamba lakes area as a protected area. A proposal was developed in late 2009 titled "Yambahti Critical Wildlife Area" by the Tlicho Government's Lands Protection Department. Having considered various legislative options for establishing the Yambahti Protected Area, the Department believes the most appropriate legislative option is to designate the area as a "Critical Wildlife Area" under the NWT Wildlife Act. Once the proposal is submitted to ENR as the potential sponsoring agency, further discussion and consultation will be required amongst all interested parties, including stakeholders, to finalize the proposal, including its boundary. Considerable work is still required to move this proposal through the Protected Areas process to final designation.

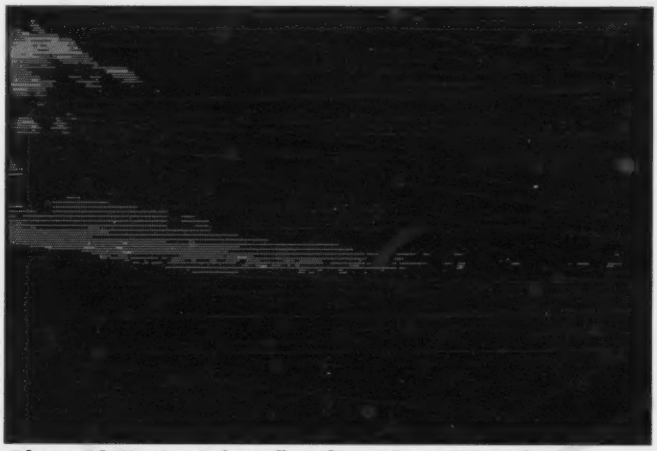

Photo 12: Daring Lake inflow from the east creek.

Conclusion

The Tundra Ecosystem Research Station continues to play an important role in facilitating environmental research, monitoring, and education programs in the low arctic tundra. Strategically located in the central barrens of the Southern Arctic Ecozone, TERS is part of a network of research stations that conducts regional, national and international research and monitoring programs.

With diamond mining in the region, TERS plays an important role in contributing baseline information and for studying project specific and cumulative environmental effects of industrial development in the Lac de Gras area. Research and monitoring studies at Daring Lake provide "control" data to a number of these impact studies. Other scientific information is also being gathered through short and long-term research and monitoring studies, addressing priority issues such as climate change, contaminants and parasites, species at risk, biodiversity and protected areas. The current research and monitoring program at Daring Lake consists of 24 short and long-term studies.

TERS is a model research station, in terms of providing high quality facilities and service to researchers while minimizing environmental impacts of human habitation. Current and ongoing upgrades are designed to continue the use of the latest green technologies, improving the efficiency and safety of its operations while decreasing the carbon footprint of the research station and its associated activities. TERS also has a number of secondary benefits. Most importantly, it provides young people with educational opportunities, training opportunities and potential career opportunities. The benefits of scientists, educators, elders and students from different cultures and geographical regions of Canada living and working in a remote, residential, camp setting on the tundra are significant.

The ongoing cooperation and contributions of all partners and users continues to make the Tundra Ecosystem Research Station and its programs a success.

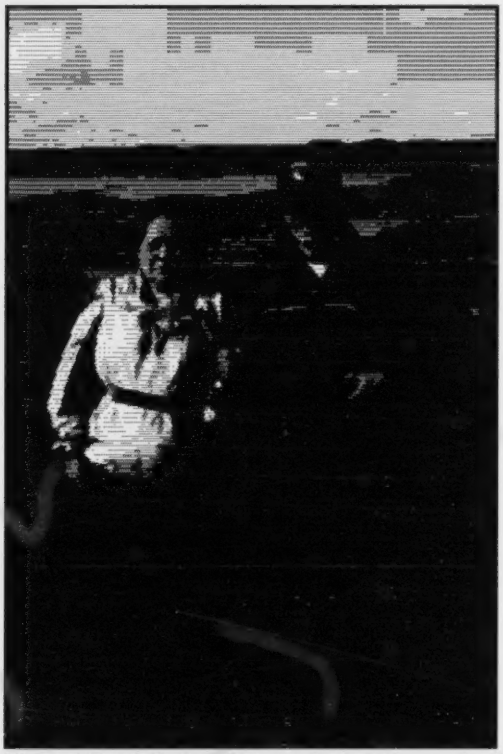

Photo 13: Michel and Bernadette Rabesca looking for caribou.